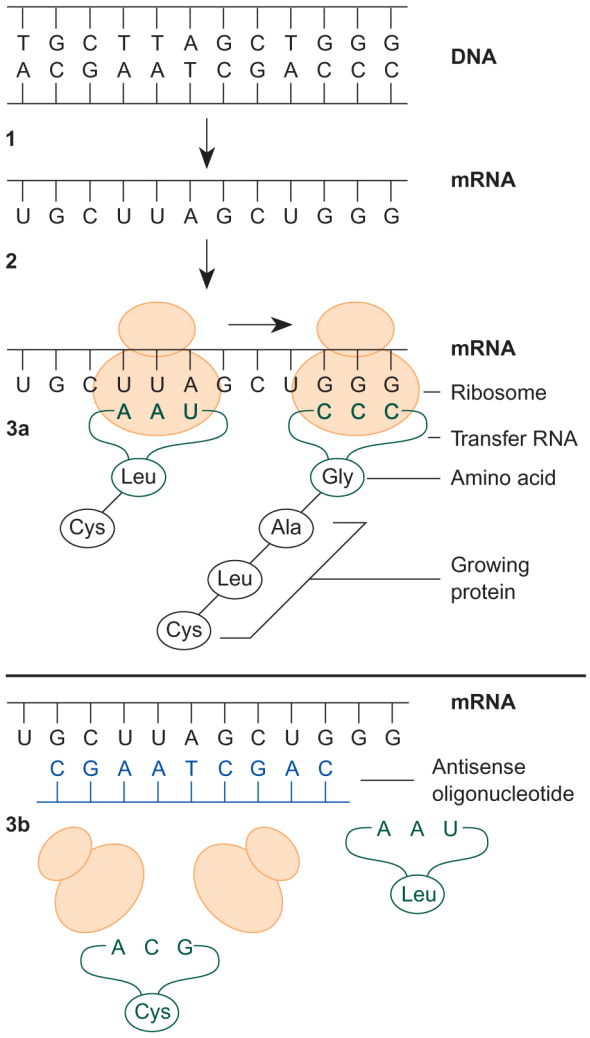
The conversion of genetic information into protein without and with antisense RNA treatment



(1) The nucleotide sequence (gene) of one of the two DNA strands is copied (transcribed) into messenger RNA (mRNA).

(2) The mRNA moves from the cell's nucleus into the cytoplasm.

(3a) Ribosomes move along the mRNA, recruiting carrier molecules (transfer RNA's, or tRNA's) that each carry a specific amino acid. The amino acids are linked to form the protein.

(3b) In antisense RNA treatment, oligonucleotides (short, synthetic DNA molecules) bind to the mRNA, forming a double-stranded DNA/RNA hybrid to which ribosomes cannot attach.

Steps 1–3a show the usual way in which the information on a DNA strand serves as a blueprint for generating proteins. In antisense RNA treatment (3b), a 'dummy' sequence of DNA prevents ribosomes from carrying out the process of making proteins. Using this technique researchers may be able to investigate the link between genes and alcohol-related problems. For example, certain proteins may be needed to manufacture neurotransmitters involved in the desire to consume alcohol; if blocking the creation of one of those proteins would change alcohol consumption, the gene(s) responsible for making that protein might be involved in the urge to drink alcohol.

Source: Hiller-Strumhofel, S., et al. Genetic engineering in animal models. *Alcohol Health & Research World* 19(3):206–213, 1995.

Prepared: February 2001